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Forest Condition and Management in Swedish Forest Commons

Eva Holmgren
Department of Forest Resource Management and Geomatics
Swedish University of Agricultural Sciences, S-901 83 Umeå, Sweden

Gun Lidestav
Department of Silviculture
Swedish University of Agricultural Sciences, S-901 83 Umeå, Sweden

Göran Kempe
Department of Forest Resource Management and Geomatics
Swedish University of Agricultural Sciences, S-901 83 Umeå, Sweden

Forest commons are regarded as a means to support local development and sustainable forest conditions. To evaluate the development impact of Swedish forest commons, comparative surveys have been undertaken in three regions, and the differences in forest condition and management between categories of commons as well as their relation to other forest ownerships have been assessed. Regional differences between the by-laws, historical development and geographical conditions are apparent. It is concluded that two of three regions have an overly restrictive harvesting policy given the purpose of the forest commons and the official forest policy. The study results underline the importance of evaluation of the performance of forest management in relation to management objectives, to ownership alternatives and to the impact of local variations in preconditions.

Keywords: Swedish forestry; forest resources management, community managed forests, forest ownership

INTRODUCTION

Globally, there has been growing interest in, and recognition of, community forest ownership and management as a tool for enhanced local development and for securing sustainable forest condition (e.g. Berkes *et al.* 1989, Ostrom 1990, Agrawal 1992, McKean 2000, Carlsson 2000, Berge 2002, Wiley 2002). The interest indicates an acknowledgment of the important role of community forests in the past and present, and also their potential future importance, for local development and survival. Before establishing new forest commons, however, it seems important to evaluate the impact of existing forest commons in relation to their specific objectives as well as the ownership alternatives. For this purpose, the Swedish forest commons, with more than a century-long history, provide an excellent study object.

This article concerns the forest commons established in 1861-1918 in connection with the Great Redistribution of Land Holdings in the counties of Kopparberg[1] and Gävleborg (W and X)[2], and the Delimitation Process in the counties of Västerbotten (AC) and Norrbotten (BD) (SFS 1952). They are generally looked upon and grouped together with public forestland (e.g. in official statistics), and hence often incorrectly regarded as non-private property. However, the land belongs to the owners of the estates which were affected by the land redistribution and delimitation processes (SFS 1952). Shares in a forest common cannot be traded separately from the estate. The ownership types include private owners, forest companies and the public sector, although private ownership generally dominates. Management is performed jointly, through boards elected by the assembly of shareholders, and executed by professional foresters. Formal control is executed by the County Administration and the Forestry Boards. The policy for how the dividend is distributed differs due to historical arrangements, and regional patterns can be discerned. Shareholders also hold hunting and fishing rights within their forest commons. The *Forest Commons Law* (SFS 1952) and some of the by-laws have rules to avoid dominance of large shareholders (Ministry of Agriculture 1983).

The intention of this comparative study has been to assess differences in forest condition and management between categories of commons and in relation to other forest owners. Data used originate from the Swedish National Forest Inventory's databases 1998-2002 and from interviews of forest common managers. The historic background and important regulations affecting the forest management are reported to provide a context for data analysis. In the concluding section, results are discussed and analysed.

A BRIEF HISTORY OF SWEDISH FOREST COMMONS

In the mid-19th century the global price on timber increased drastically due to an international economic upswing (Wik 1950) and commercial exploitation of the Swedish forests began, primarily driven by forest company and sawmill interests. This caused fear of irreversible depletion and degradation of the forests (Östlund 1993). At that time the state was finalising a delimitation process that involved the fixing of boundaries between Crown and private land, although the interior areas of AC and BD remained unallocated (Stenman 1983). The process of delimitation of Crown land was preceded by another change of property rights, at the time almost finalised, namely the Great Redistribution of Land Holdings. This redistribution occurred in parts of the two counties, W and X. Both processes aimed to create larger and more productive farms, and by this process strengthen the local economy and the taxation base for the Crown (Liljenäs 1982, Carlsson 1995).

In anticipation of the finalisation of the above processes, many of the farmers had sold cutting rights to their forest or their entire farm to sawmill companies (Arell 1979). In an attempt to halt this development the authorities introduced the concept of forest commons.[3] Under the proposed scheme, farmers would receive one part of

[1] The county name was changed to Dalarna on 1st January 1997.
[2] W, X, AC and BD are the Swedish official county symbols.
[3] The Swedish forest commons can also be labeled 'community managed forests' (Carlsson 2001).

their forest share as individually owned land and the other as a share in a jointly managed area, a forest common. The size of each farmer's forest share was based on the proportion of arable land and its productivity. The idea was that these commons would be managed in such a way that they would provide a lasting economic base for the farmers and local communities, and thus be protected, through good forest management, from deforestation and degradation (Liljenäs 1982). The introduction of forest commons could also be seen as a government distrust of the farmers' capacity to manage their forests (Kardell 1991).

During the period 1861-1894, a number of forest commons were formed in W and X by setting aside about one third of the farmers' allocated forestland under common custody (Liljenäs 1982). In BD, the local authorities headed by the County Governor worked vigorously for the creation of forest commons in connection with the delimitation. In 1877, the Government gave its permission for voluntarily formed forest commons in the areas still not delimitated in AC and BD. Thus, under active supervision from the BD County Governor, a large number of forest commons were created in BD, during the period 1876-1894[4]. They consisted of about one quarter of the allocated forestland. In AC no forest commons were formed voluntarily. The County Governor did not actively seek their formation, and the sawmill companies lobbied forcefully against their establishment (Liljenäs 1977). It was however declared in 1906, through a royal decree (SF 1906), that close to half of the allocated forestland in all not yet delimited forests in Lapland should be designated as forest commons. This decree was applied in the four remaining municipalities in AC and in some newly colonised areas in BD[5]. These commons were established during 1916 to 1918.

There are presently 33 Swedish forest commons, all in the four northern counties of BD, AC, W and X. Together they cover 540,000 ha of productive forestland (Ministry of Agriculture 1983) held by 25,000 shareholders (Carlsson 1999). All forest commons are under the same national laws and regulations, including the *Swedish Forest Act* (SFS 1979), which regulates the management of Swedish forests. However, their formal organisation and activities are regulated by a special law, the *Forest Commons Law* (1952). According to the 1906 decree (SF 1906), the dividend in AC is paid to all shareholders as annual payments in proportion to the size of their share in the forest common (Stenman 1983). The dividend in the BD, W and X[6] counties should, according to royal decrees at their establishment, and later to the *Forest Commons Law* (SFS 1938, 1952), be divided among the shareholders as monetary subsidies for purposes benefiting agricultural development such as drainage and agricultural training, or to public assistance measures such as medical service, social welfare, school teaching and assistance to electrification (Liljenäs 1982). Each forest common also has its own set of by-laws, authorised by the County Administration, which regulates the direct management of the common (Carlsson 1995).

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[4] As far back as 1876, after a request from the local population to the Government, a forest common was formed in Pajala (Liljenäs 1982).

[5] Three of the smaller forest commons included in the study were established later than the others in BD, in the municipalities of Arjeplog, Gällivare and Jokkmokk (Lijenäs 1982). Special regulations apply for these.

[6] Svärdsjö, Svartnäs and Envikens forest commons in W and X also distribute their dividend as annual payments to shareholders.

Regulations Affecting Forest Condition and Management in the Forest Common Area

The establishment of the Swedish forest commons began in 1861 in W and X, with the last common areas established 57 years later in AC (Liljenäs 1982, Carlsson 1995). During this period many changes took place in general political conditions and in forest legislation, and the forest industry experienced a period of economic and industrial development. In this time it is discernible that the authorities increased restrictions concerning the sharing of benefits from the land tenure reform. This was particularly true for the inner parts of AC and BD where the 1866 regulations[7] (SFS 1866) concerning the disposal of forests, and the *Revised delimitation regulations for Lapland in Västerbotten and Norrbotten* from 1873 (SFS 1873), reduced the farmers benefits both with respect to the size of the allocated forestland and also through the abolishment of the free right of disposal of the forests (Arell 1979, Enander 2003). Trees could only be felled after permission from a forest officer. This made the forests less attractive to sawmill owners but also to farmers. Contradicting these changes, the law still permitted sale of farms or cutting rights that made it possible for the forest companies to speculate in forests. The sawmill companies were active in buying private forestland and cutting rights in the period from late 1880 to 1900. In 1900, in the AC municipality Sorsele, forest companies controlled about 12% and possessed the cutting rights to about 70% of the farmers' allocated land (Arell 1979).

Sweden launched its first *Forestry Act* in 1903, thereby introducing regeneration regulations. In the *Forestry Act* of 1923, protection of young forests was launched. Regulations prescribing the minimum stand age for final felling were first introduced in 1918, and extended by the *Forestry Act* of 1948 to protect so-called vigorous forest from premature final felling[8] (Enander 2003). The revision of the *Forestry Act* in 1948 included a statute requiring an even output of timber over time and better silvicultural methods designed to increase productivity and therefore raise economic returns from forest areas. Sustainability, profitability and social considerations were established as priority objectives. In the revised Swedish *Forestry Act* of 1993 production goals and conservation goals were both given equal importance (Enander 2000, 2001). A guiding principle for the application of the law has been that the aims of the law, if possible, should be reached on the basis of voluntary agreement without using compulsion (Enander 2000).

The forest commons should, according to the state's intentions, be managed intensively following management plans aiming at high and even outputs (Ministry of Agriculture 1983). From the second half of the 19th century, forest management was to a large extent in the hands of the Swedish Forest Service (Domänverket). The Forest Service supervised the disposal of the forests, and their forest practice in state-owned forests was commonly used as guidance for other forest owners (Enander 2000). In 1934, the supervision of the disposal of the forests was handed over to the County Forest Boards. Gradually, the authorities' control and management over the commons decreased, and through the *Forest Commons Law* (SFS 1952) they reached the independence they have today. Until the end of the 1940s, the most common management method was 'exploitation forestry' or 'high-

[7] This law restricting the free disposal of the forests expired in 1949 (Arell 1979).
[8] This regulation is based on profitability considerations.

grading' of forests. Such management often created open, low production forests (Enander 2001). This management strategy changed around 1950, moving to a system that used clear felling, soil scarification, planting, pre-commercial and commercial thinning, thereby transforming large areas into young even-aged forests dominated by pine and spruce. The forest policy applied by the forestry sector since the 1950s aims to ensure sustainable timber production (including environmental considerations) at a high and even volume level. An even age class and maturity class distribution is sought. This view on sustainable forest management has been applied as a basis for the analyses and interpretations reported here

Multiple Forest Use and Competing Interests

Reindeer breeding is permitted in northern Sweden, on an area consisting of more than a third of the country. One important issue for the reindeer husbandry interests is to protect old, undisturbed forest types of spruce but also pine and birch, where reindeer feed on lichens (Johansson 1999). The *Swedish Reindeer Husbandry Act* (SFS 1971) together with the *Forestry Act* regulates the interaction between the reindeer husbandry interests and the forest owners. According to the *Forestry Act*, the bigger forest owners within the all-year grazing areas, which include a majority of the study area in AC and BD, are obliged to consult the reindeer husbandry interests before deciding on any major forest activity.

Greenpeace and other NGOs have created a world opinion on the preservation of the forest situated above the official proximity boundary to high mountains, and special regulations now apply to these. Increased international demands on preservation, partly channeled through Swedish forest authorities, are often perceived by local forest owners as threatening or severely limiting their right of decision over their forests as well as the future for the forest industry in these areas (cf. S:son-Wigren and Sandström 2001a, 2001b, Lisberg Jensen 2002). The forest commons are in a particularly vulnerable position, not least because their land cannot easily be exchanged for land in less exposed areas. In recent years, logging in forests in close proximity to high mountains has created many conflicts (c.f. S:son-Wigren and Sandström 2001a, 2001b, Lisberg Jensen 2002). Hunting and fishing rights have always been an important concern for shareholders in the commons. This may be especially true for the shareholders who have moved out of the area but return to their home district during the hunting seasons (S:son-Wigren and Sandström 2001a, 2001b).

GEOGRAPHICAL FEATURES OF THE STUDY AREA

The research area covers all productive forestland within each municipality with a forest common, a total land area of 4.78 M ha divided roughly between three counties and regions as follows: the inner parts of the County of Norrbotten (BD, 2.24 M ha), the inner part of County of Västerbotten (AC, 1.01 M ha) and parts of the County of Kopparberg including a piece situated in the County of Gästrikland (W and X, 1.53 M ha) (Figure 1 and Table 1).

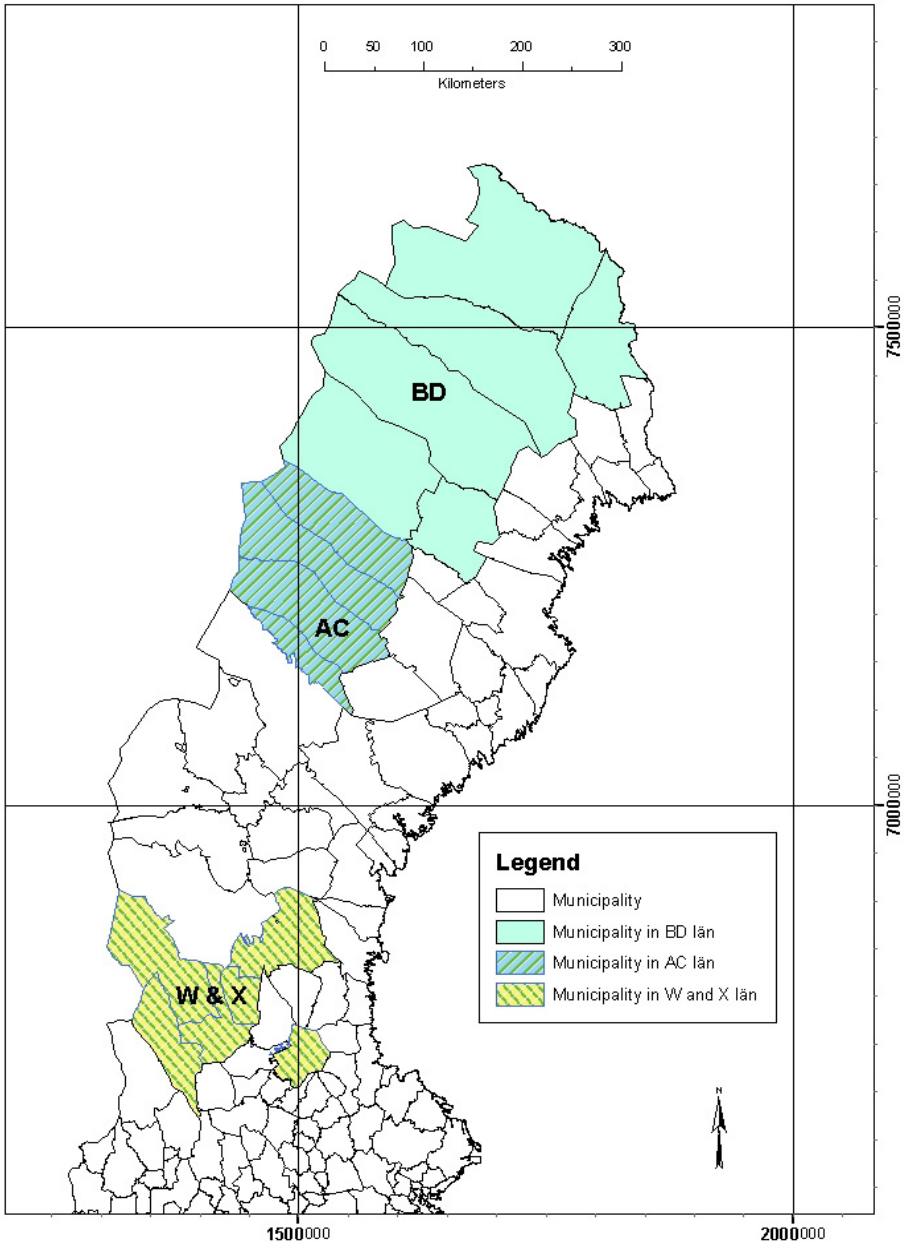

Figure 1. Map of northern Sweden indicating municipalities with forest commons in the counties of BD, AC, W and X

The ownership structure in the study area comprises forest commons 10%, public forests 12%, company forests 45% and non-industrial private forests (NIPF) 33%. BD has the lowest percentage of forest commons (7%) while W and X has the highest (13%) and AC (11%) is in between. Company forests are the most common

ownership type in BD while the NIPF and company forest have a close to equal share (around 40%) in AC and W and X.

Table 1. Distribution of forestland area by ownership class in the three regions

Owner category	Region			Total
	BD	AC	W and X	
Forest commons (%)	7	11	13	10
Public forests (%)	15	12	8	12
Company forests (%)	51	36	40	45
NIPF (%)	27	41	39	33
Research area (Mha)	2.24	1.01	1.53	4.78

The study area is part of the boreal forest region, dominated by stands of Scots pine (*Pinus sylvestris L.*) and Norway spruce (*Picea abies (L.) Karst*), sometimes mixed, and sometimes supplemented by broadleaved trees, mainly birch *(Betula sp.)*. Broadleaved stands are rare, with the highest percentage (8%) on NIPF in BD and AC. In W, X and BD, more than half the forestlands are pine stands. In contrast, spruce forests dominate in AC with the exception of the AC company forests, which have 42% pine and 27% spruce.

BACKGROUND AND AIM OF THE STUDY

In an evaluation by the Swedish Commission on Collectively-Owned Forestland (Ministry of Agriculture 1983, p. 15) it was concluded that the Swedish forest commons are 'among the best managed forests in the country'. In addition, the Commission reported that annual cuttings in forest commons generally reached 100% of their approved management plans. Considering that the forest commons have been managed in accordance with the state's intentions and the *Swedish Forest Act*, a logical interpretation of this statement is that the production capacity of the forest commons, in terms of the timber harvets, is fully used. However, Carlsson (1995) calculated harvesting quotas which indicate that only three out of 24 forest commons had harvesting quotas supporting such interpretation. The figure was obtained by dividing the annual harvested volume (m^3)[9] by the forests commons' own annual production of biomass (m^3) for 1975-80[10] and 1980-93 (Carlsson 1995, 1999). In the later study, Carlsson (1999, p. 18) emphasised this finding, and commented that the low harvesting quotas are 'puzzling' and furthermore that there seems to be no statistical correlation between timber price and the size of the dividend paid to shareholders. In order to explain this phenomenon, Carlsson (1995) introduced the target-income hypotheses. To reach a preset target, the forest commons harvest less when timber prices rise and more when prices fall. The target-income has, according to Carlsson (1999), the effect that the shareholders can rely on even and predictable forest revenues without running the risks of over-harvesting.

[9] Harvest volume is measured as cubic metres of standing volume (stem volume over bark from stump to tip).

[10] Carlsson used figures from Ministry of Agriculture (1983).

Considering the definition of sustainable forest management in the *Forest Act* and the state's intentions for the forest commons, a low harvesting quota has to be regarded as poor management. In order to evaluate the management, it is necessary to not only consider the harvesting quotas but also the forest conditions. By studying the present status of the forests, a picture of the management effectiveness is provided, as the results of actions taken (or not taken) are revealed. Furthermore, to evaluate forest conditions from the commons it is necessary to compare data for the commons with data from other forest owner-categories under similar ecological conditions. For this reason, forests close to the forest commons have been included in the study. Also, the data have been divided into three regions to enable an inter-regional comparison in relation to the differing institutional frameworks. Site productivity and proximity to high mountains are taken into account, to compare differences due to geographical conditions. The analysis seeks to determine whether the forest commons arrangement has been an efficient tool to achieve management aims for these forests.

RESEARCH METHOD

The research has involved a comparative study of the state of the forests in the Swedish forest commons and surrounding forests. Only municipalities with a forest common are included in the study. Forestland is defined as 'Land suitable for wood production and not primarily used for other purposes. Potential yield under ideal management conditions is at least $1m^3$ per hectare and year' (Skogsstyrelsen 2000, p. 311). The data used in the study originate from the Swedish National Forest Inventory's (NFI) database from the years 1998-2002. The NFI is an all-encompassing annual inventory of Swedish forests, carried out by the Swedish University of Agricultural Sciences, with the objective of providing basic data for research and planning and control of forest resources at a national and regional level. It is a stratified systematic cluster-sampling inventory with partial replacement of plots (Ranneby *et al*. 1987).

The forestland was then divided into four owner categories, namely non-industrial private forests (NIPF), company forests, forest commons and public forests. Public forests include State-owned forests and forests owned by other public institutions including churches, municipalities, public foundations and other public institutions. Company forests are forests owned by joint-stock companies, private or public. A number of parameters are compared between the four owner categories as well as between and within the three counties and regions involved.

The forest type is defined by its' tree species mixture. In young stands, the proportion ascribed to each species is based on number of stems and in older stands on basal area. The site productivity or potential yield, which expresses the capability of a site to produce wood, is classified according to the SHS system (Hägglund and Lundmark 1981). It is 'measured as mean production in m^3 per year and hectare during a specified rotation period in an ideal forest' (Skogsstyrelsen 2000). Estimations of the distance to roads open for heavy traffic for most of the year and proximity of high mountains are based on aerial observations. The administrative definition by Skogsstyrelsen (1991) is used for the estimations of the proximity of high mountains.

The parameters for stand age and maturity classes are expressions of the degree of maturity of the stand and should be regarded as complementary to each other. Stand age is defined as the basal-area-weighted age of the trees, excluding standards[11] and seed trees. Maturity status is divided into four groups, namely not regenerated forestland, pre-commercial thinning forest, commercial-thinning forest and final-felling forest. The category 'mature for final felling' contains only forest that was, at the time of the inventory, mature according to the legal regulations (Skogsstyrelsen 2000). A forest overstorey inventory, where the trees are callipered and species recorded, has been used for volume and increment estimation. Increment cores from sample trees are used for increment estimations and to support age estimation in the field.

For each region the equality of productivity among the four owner categories has been tested with the statistic $T = (x - \bar{x})' S^{-} (x - \bar{x})$ where x is the vector of the four estimates, $\bar{x}$ their (un-weighted) mean and S^{-} a generalised inverse of the (estimated) covariance matrix of the four vectors. Under the null hypothesis of equality, *T* is approximately a Chi-square distribution with three degrees of freedom. When overall significance is indicated, further pairwise comparisons are made by analogous *z*-tests.

Forest common managers were interviewed to provide estimates of the mean annual increments and mean annual harvests of the stands, so as to calculate average harvesting quotas for each region. These quotas are compared with harvesting quotas originating from Carlsson (1995).

FOREST ECONOMIC CONDITIONS OF STUDY AREA

Mean site productivity generally increases from the north to the south (Table 2). However, the AC forest commons together with the BD public forests and the BD NIPF have the lowest mean site productivity in the study area ($p<0.05$). The forests with the highest mean site productivity are found on W and X forests, particularly on NIPF in W and X. The estimated productivity values were calculated together with 95% confidence intervals.

Both the AC and W and X forest commons were found to have lower site productivity than the other forests within their respective regions. No differences are apparent between the site productivity of other forests ownerships in AC. Site productivity conditions are more complex in W and X, where productivity of public forests does not differ significantly from the company forests. BD public forests have lower average site productivity than the BD company forests and BD forest commons. Productivity of the BD public forests and NIPF does not differ significantly, and in fact there are no significant differences between the BD NIPF and any forest in BD.

The distance to roads in forest areas indicates both the remoteness of the forests and how active the forest management has been. The highest proportion of remote forestland (more than 1 km from a road) is found in public forests in BD (43%) and forest commons in AC (44%) (Table 2). The AC forests in general, and the AC forest commons in particular, are closest to the official boundary for forestland in

[11] Standards are the considerably older trees, sparsely occurring in stands of trees.

the proximity of high mountains. Much of the public forestland in BD also falls within this zone.

Table 2. Mean site productivity and share of forestland 1 km or more from a road or close to high mountains

Region	Owner category	Mean site productivity with 95% confidence limits (m^3/ha/year)	Fraction of forest more than 1 km from road (%)	Fraction of forest above official proximity boundary to high mountains (%)
BD	Forest commons	2.48 ± 0.11	32	12
	Public forests	2.29 ± 0.08	43	32
	Company forests	2.53 ± 0.07	21	7
	NIPF	2.45 ± 0.08	28	11
AC	Forest commons	2.34 ± 0.08	44	52
	Public forests	2.69 ± 0.11	17	38
	Company forests	2.84 ± 0.12	11	11
	NIPF	2.73 ± 0.12	12	26
W and X	Forest commons	3.54 ± 0.09	5	0
	Public forests	3.92 ± 0.18	8	8
	Company forests	4.11 ± 0.12	5	2
	NIPF	4.66 ± 0.16	2	1

The age class distribution is characterised by a general lack of medium-aged forests and a surplus of forests older than 100 years (Table 3). The forest commons and public forests have the highest percentage of old forests (100 years or more) and the company forests the lowest percentage. To some extent this can be explained by the lower site productivity and thereby longer rotation period on the commons and public land. The most even age distribution was found in the NIPF, particularly in the BD NIPF. BD displayed the most even age distribution across forest ownership types among the three regions studied, and the BD forest commons displayed the most even age distribution among the forest commons. The most uneven age structures were found in AC, with the exception of AC company forests which followed the same pattern as the other company forests, having a low percentage of old forests and a high percentage of young forest. The AC forest commons and AC public forests were found to have a higher percentage of old forest (100 years or older) than the AC company forests. Only 24% of the AC forest commons area is younger than 80 years. This certainly indicates that the management of the AC forest commons, since they were established 80 years ago, has been restrictive regarding clearfelling. While other forest ownerships display an increased activity in regeneration (age class 0-20 and 21-40), the AC forest commons consistently show low activity.

Table 3. Percentage distribution of forestland area by age classes within owner categories and regions, 1998-2002

Region	Owner category	Distribution of forestland area by age class (year, %)							Total number of plots
		0-20	21-40	41-60	61-80	81-100	101-140	>141	
BD	Forest commons	20	15	12	12	7	16	18	251
	Public forests	8	17	12	5	9	27	22	561
	Company forests	19	23	18	11	6	13	10	2144
	NIPF	18	11	15	16	13	17	10	1193
AC	Forest commons	5	7	6	6	14	40	22	115
	Public forests	18	14	2	3	6	37	20	199
	Company forests	33	21	10	3	6	20	7	701
	NIPF	22	10	9	5	11	33	10	632
W and X	Forest commons	23	20	7	7	6	27	10	587
	Public forests	26	21	10	8	6	21	8	463
	Company forests	27	19	8	7	11	20	8	2014
	NIPF	26	15	10	9	11	21	8	2054

Due to variations in site productivity, altitude, latitude and tree species, the stands are regarded as mature for final felling at different stand ages. Therefore the distribution of maturity classes provides better information than age class on the potential for final felling, thinning and other silvicultural activities. An analysis of forests mature for final felling (Table 4) reveals large differences between regions and owner categories. The largest disparity within a region is for AC where 75% of the forest commons are mature for final felling compared to 30% of the company forests. Also the public forests in AC have a high share of forest mature for final felling. Approximately 50% of the NIPF in AC and the public forests in BD were found to be mature for final felling, while other owner categories in BD display a lower percentage of mature forests. Differences in stand maturity between owner categories in W and X are not noteworthy. However, considered in relation to the management objectives of ensuring sustainable, high and even outputs, BD and AC public forests, AC NIPF and in particular the AC forest commons have too much mature forest and consequently too little younger forest.

In general terms the standing volumes (m^3/ha) in a stand increase with age. Therefore, forest estates with a higher share of older or mature stands are more likely to have a higher mean standing volume. A proper comparison should therefore be based on standing volumes within each age class, to avoid unreliable conclusions about forest conditions and management practices. As indicated in Table 5, mean standing volume in AC forest commons is 90 m^3/ha compared to 70 m^3/ha in AC company forests, although standing volumes in all of the age classes are lower on AC forest commons. In fact, standing volumes in the AC forest commons are with few exceptions lower than in all the others. Therefore, it cannot be stated as a general conclusion that forest commons are among the best managed (cf. Ministry of Agriculture 1983).

Table 4. Fraction of forestland area with forest mature for final felling, within ownership category and regions, 1998-2002 (%, and 95 % confidence interval)

Owner category	BD	AC	W and X
Forest commons	38 ± 9	75 ± 11	42 ± 5
Public forests	51 ± 8	63 ± 11	33 ± 4
Company forests	27 ± 4	29 ± 7	34 ± 3
NIPF	34 ± 5	51 ± 7	39 ± 4

Table 5. Standing volume of forestland within age classes, ownership categories and regions, 1998-2002

Region	Owner category	Standing volume within age class (m^3/ha)							
		0-20 years	21-40 years	41-60 years	61-80 years	81-100 years	101-140 years	>141 years	Mean[a] of all age classes
BD	Forest commons	13	13	51	82	110	125	114	68
	Public forests	11	30	52	86	92	99	107	75
	Company forests	10	25	65	87	98	120	116	62
	NIPF	11	26	56	73	102	113	122	69
AC	Forest commons	9	8	25	78	91	116	107	90
	Public forests	8	73	126	92	94	153	185	117
	Company forests	10	28	62	100	132	161	176	70
	NIPF	9	37	98	102	97	122	131	84
W and X	Forest commons	9	45	92	129	109	143	161	87
	Public forests	15	50	123	132	159	112	159	83
	Company forests	16	62	119	158	167	183	142	102
	NIPF	18	64	153	186	190	192	216	146

a. Overall mean.

Harvesting quotas for the period 1998-2002 (Figure 2) indicate that both AC and BD forest commons harvest considerably less than the annual increment, which is even lower than the quotas in 1975-80 and 1980-1993 presented by Carlsson (1995).

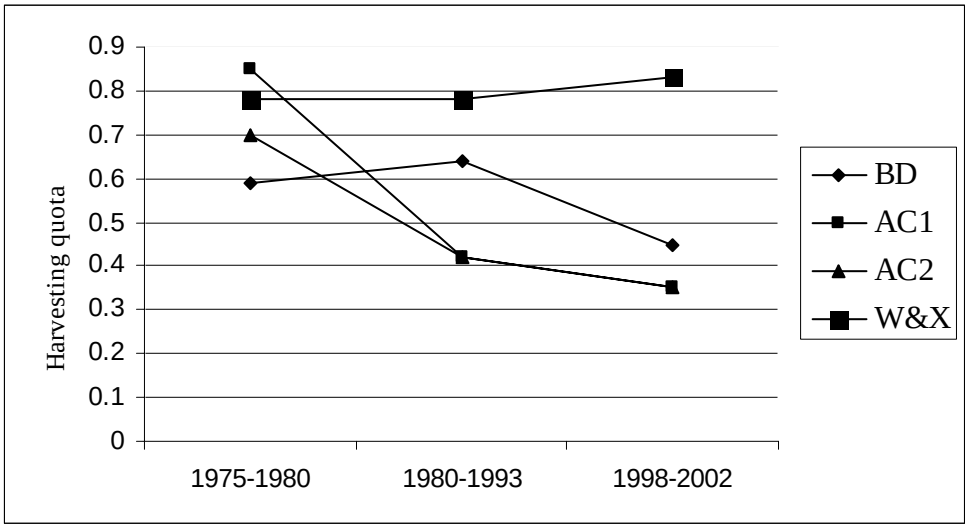

Figure 2. Average harvesting quotas (annual harvest/annual increment) in forest commons, within regions for the periods 1975-1980, 1980-1993, 1998-2002[a]

[a] Data from some of the smaller forest commons, covering about 5.5% of the productive forest land of the forest commons, were not available for the period 1998-2002 and consequently are not reflected in the calculations. The figure for the period 1975-1980 in the AC1 curve was irregularly high in one of the AC commons. According to the manager a harvesting quota around 0.33 has been the norm since the 1920s. In AC2, that forest common was excluded. Figures for the first two periods originate from Ministry of Agriculture (1983) and Carlsson (1995).

DISCUSSION AND CONCLUDING COMMENTS

In line with Carlsson (1995), no indications of over-harvesting were found on forest commons. Rather the distributions of age and maturity classes and the harvesting quotas indicate an overly restrictive harvesting policy in AC and BD considering the purpose of the forest commons and the official forest policy. On the other hand, forest condition and management practices on forest commons in W and X seem to be in accordance with the purpose of the forest policy. The idea that the forest commons are among the best managed in the country (Ministry of Agriculture 1983, Carlsson 2000), is likely to have been based on the case in W and X without considering regional differences, particularly the deviant situation in AC.

In general, the study reveals that the status of the forests in the AC forest commons differ not only from the surrounding forests in AC, but also from the other forest commons. As the present status of a forest, including measures of proximity to roads[12], to a large extent depends on the management performed, these differences

[12] In the study, a long distance to road is interpreted as an indication of low harvesting activity. This is because Sweden, on the whole, already has a relatively high density of systematically planned forest roads. Constructions of new roads are normally done for the reduction of forwarding costs in individual harvesting operations.

are interpreted mainly as a result of different management strategies. The profitability, which to a large extent depends on the market situation and the distance to processing facilities, is a crucial factor to any harvesting operation. However, the market situation and distances to processing industry are similar for NIPF owners and forest commons. The geographical conditions (site productivity, altitude, and proximity to high mountains) are somewhat less favorable on AC forest commons, but not decisive to the outcome. This conclusion is based on the comparison with BD public forests and BD NIPF, which also have low mean site productivity, and in the case of the BD public forests large areas in close proximity to high mountains. Further, these areas are not as deviant as the AC forest commons in regard to their age structure, the proportion of forests mature for final felling and their harvesting quotas. Whether the forest conditions are a result of the conditions prevailing when the commons were created, cannot be determined by this study. It is notable, however, that the AC forest commons were established by a top-down decision, and at a late and relatively advanced stage of the exploitation process (Liljenäs 1982, Stenman 1983). The County Administrations' low interest in the forest commons and the company forests strong position in AC (cf. Liljenäs 1977) may have been decisive to the outcome of the process in terms of the location of forest commons and their regulation in AC.

In terms of learning from existing community forests, results of this study highlight the importance of evaluating these forests in relation to the management objectives that have been set for them and their performance in relation to those forests under alternative ownership structures. On the basis of the findings of this and other studies, it may be concluded that particular basic conditions are, to a greater or lesser degree, conducive to successful regimes. McKean (2000) pointed out the importance of recognising the forest commons as shared private property, comparable to business partnerships or joint-stock corporations. In this respect there are several indications that other interests, including reindeer husbandry, tourism and nature conservation – as expressed by various NGOs, the government, the Sámi[13] and others – have reduced the owners control of the forest commons and limited the range of action they can take (S:son-Wigren and Sandström, 2001a, 2001b, Lisberg Jensen, 2002).

The data obtained in this study do not allow testing of the target-income hypothesis of Carlsson (1995). The critical question, however, is why the targets and harvesting levels are high in W and X but so low in AC and BD. The answer to this may lie not only in the processes that have formed the forest commons, but also in the process of decision-making in the individual cases. Furthermore, the distribution of the dividend, as an inducement for innovation and active forest management, appears to be a regional feature worth considering. Because the knowledge of success of common-property regimes is far from complete, McKean (2000) has suggested that variations in the socio-cultural support, administrative and financial support, institutional overlap and conflict management aspects of these regimes could be keys to understanding differences in their success. If so, it is likely that the variations in these factors have also had an impact on the Swedish forest commons, and further investigation of these factors is warranted.

[13] The sámi are indigenous people of the north of the Scandinavian Peninsula, a region popularly known as Lapland.

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